

REMARKS

Claims 1-27 are pending. Claims 1, 12, 19, 22, and 23 are in independent form. Claims 1, 11, 12, 19, and 22 have been amended based on the disclosure in the application as originally filed. No new matter has been added. Reconsideration and allowance are respectfully requested.

Rejections under 35 U.S.C. 112

Claim 19 and 22 stand rejected under 35 U.S.C. 112 for allegedly being incomplete for omitting essential elements. Without conceding the propriety of the rejections, independent claims 19 and 22 have been amended to obviate the respective rejections and to expedite prosecution.

Independent claim 19 has been amended and now recites in part “accessing a database, stored in a storage medium, having voice prints of known speakers.” The Office asserts “there is no recitation in the claim language as to how the database is provided, generated, and stored to ultimately compare the voiceprints for the purpose of speaker identification” (Office action dated 10/30/2008, page 3). Claim 19 is directed towards accessing a database and not towards the generation of the database. Additionally, claim 19 clearly recites what is stored in the database. Claim 19, as currently stands, provides all of the essential elements for the claimed subject matter: “A computer-implemented method, comprising: accessing a database, stored in a storage medium, having voice prints of known speakers, wherein each voice print includes a set of topological numbers to distinguish a speaker from other speakers and is derived from a relation between a periodic orbit derived from a power spectrum of a speaker’s voice and a periodic orbit from a power spectrum of an audio reference in a three-dimensional space; comparing a voice print of an unknown speaker to the database to determine if there is a match, wherein the voice print of the unknown speaker includes a set of topological numbers that is derived from a relation between a periodic orbit derived from a power spectrum of the unknown speaker’s voice and the periodic orbit from the power spectrum of the audio reference; and selectively granting access to the unknown speaker based on the comparison.”

Independent claim 22 has been amended and now recites in part “An apparatus comprising: a storage medium that stores a set of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers.” Claim 22 is directed towards a storage medium that stores a set of rational numbers and not towards the generation of the set of rational numbers. Claim 22 does not require the apparatus to generate the set of rational numbers. Further, Claim 22 clearly recites what is stored in the storage medium. Claim 22, as currently stands, provides all of the essential elements for the claimed subject matter: “An apparatus comprising: a storage medium that stores a set of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers, wherein the rational numbers are derived from a relation between a periodic orbit from a power spectrum of a speaker and a periodic orbit for a power spectrum of an audio reference in a three-dimensional space.”

Thus, the withdrawal of the rejections is respectfully requested.

Rejections Under 35 U.S.C. §101

Claims 1, 12, and 19 stand rejected under 35 U.S.C. 101 for allegedly not being in compliance with 35 U.S.C. 101. Without conceding the propriety of the rejections, claims 1, 12, and 19 have been amended to obviate the respective rejection and to expedite prosecution.

The Office states, in regard to a patent-eligible process claim, that as “clarified in *Bilski*, the test for a method claim is whether the claimed method is (1) tied to a particular machine or apparatus, or (2) transforms a particular article to a different state or thing” (Memorandum entitled “Guidance for Examining Process Claims in view of *In re Bilski*” dated 1/7/2009; emphasis added). Claims 1, 2, and 19 are tied to a particular machine or apparatus.

For example, independent claim 1 has been amended and now recites in part “receiving, in a processing device, a speech signal produced by a speaker’s voice.”

Independent claim 12 has been amended and now recites in part “using a voice recording device to record sounds produced by a speaker” and “storing, in a storage medium, a selection of the topological indices to distinguish the speaker from other speakers who have different topological indices.”

Independent claim 19 has been amended and now recites in part “accessing a database, stored in a storage medium, having voice prints of known speakers.”

Thus, the withdrawal of the rejections is respectfully requested.

Rejections Under 35 U.S.C. §103

Claims 1-3, 11-22, and 27 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Uchiyama (Uchiyama et al, US patent 5,121,428) in view of Mindlin (“Topological analysis and synthesis of chaotic time series”) and Trevisan (“Nonlinear aspects of analysis and synthesis of speech time series data”). Claims and 4-7, 9-10, and 23-27 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Uchiyama in view of Mindlin, Trevisan, and in further view of Parra (US patent 5,313,556). Claim 8 stands rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Uchiyama in view of Mindlin, Trevisan, Parra, and in further view of Davis (Davis et al., US Publication 20020147588). Reconsideration and allowance are respectfully requested based on the amendments and the following remarks.

Independent claim 1 has been amended and now recites in part “extracting a set of topological indices from an embedding of spectral functions of the speech signal and a reference signal, wherein the topological indices describe a relative topological relation between the speech signal and the reference signal; and generating, based on a selection of the topological indices, a biometric characterization of the speaker” (emphasis added).

In rejecting claim 1, the Office asserts that “extracting spectral features from a speaker’s voice” and “using a selection of the spectral features as a biometric characterization of the speaker” are taught by Uchiyama’s disclosure of a feature extractor, e.g., the Office asserts that Uchiyama teaches the use of a feature extractor which extracts spectral data values for speakers and compares it to registered users for the purposes of speaker identification (Office Action dated 10/30/2008, page 5; emphasis added). However, “spectral features” is not recited by claim 1. Instead, claim 1 extracts a set of topological indices and generates a biometric characterization based on a selection of the topological indices. The Office has apparently associated topological indices with spectral features. Applicants disagree with the Office’s apparent association. Furthermore, the following remarks will show Uchiyama does not teach or suggest the use as of

topological indices as claimed. Nonetheless, claim 1 has been amended to clarify the claimed subject matter and to expedite prosecution.

Uchiyama teaches that “feature extractor 15 extracts features of the input speech signal for every block” and that “features are described by an arithmetical average of the time-series spectral data values over each of the blocks” (col. 5, lines 14-17). In stark contrast, the topological indices, as claimed, describe a relative topological relation between the speech signal and the reference signal.

Uchiyama's features are completely different from the claimed topological indices. First, a Uchiyama feature does not describe a relationship between different signals. Second, because Uchiyama's features are an arithmetical average of the time-series spectral data values, one of ordinary skill in the art would recognize that such an arithmetical average is not capable of expressing a relative topological relation. As a result, Uchiyama fails to teach or suggest the claimed topological indices. Accordingly, Uchiyama fails to teach or suggest extracting a set of topological indices from an embedding of spectral functions of the speech signal and a reference signal. Thus, Uchiyama fails to teach or suggest generating, based on a selection of the topological indices, a biometric characterization of the speaker.

Mindlin discloses:

“We have developed a topological procedure for analyzing chaotic time series which identifies the stretching and squeezing mechanisms responsible for chaotic behavior in low-dimensional dynamical systems. These mechanism, quantitatively describes by a “template” or “knot-holder”, can then be used to model the processes which generate the original chaotic data set.”

See Mindlin at Abstract. Mindlin's Abstract and the rest of Mindlin's disclosure are silent on processing a speech signal or anything related to characterizing a speaker. Thus, it is not surprising that Mindlin completely fails to teach or suggest generating, based on a selection of the topological indices, a biometric characterization of the speaker.

Trevisan also completely fails to teach or suggest generating, based on a selection of the topological indices, a biometric characterization of the speaker.

Thus, the Office's proposed combination of Uchiyama, Mindlin, and Trevisan fails to teach or suggest generating, based on a selection of the topological indices, a biometric characterization of the speaker.

For at least these reasons, independent claim 1 is patentable.

Similarly, dependent claims 2-11 are patentable based on the above reasons and their own merits.

Additionally, dependent claim 2 recites in part "comparing the set of topological indices for the second speaker to the set of topological indices for the speaker; verifying the second speaker as the speaker when there is a match between the set of topological indices for the second speaker and the set of topological indices for the speaker." The Office asserts Uchiyama's distance calculator and decision part against claim 2 (Office action, page 7).

Applicants disagree.

Uchiyama teaches a "distance calculator for calculating a distance between the features of the unknown speaker extracted by the feature extractor and the reference features stored in the memory" and a "decision part makes a decision as to whether or not the unknown speaker is a real speaker by comparing the calculated distance with a predetermined threshold value" (col. 2, lines 14-20). As previously noted, topological indices as claimed are not equivalent to Uchiyama's features. Furthermore, one of ordinary skill in the art would recognize that one cannot compute a distance between the claimed topological indices. Thus, the topological indices as claimed still are not equivalent to Uchiyama's features.

For at least this additional reason, claim 2 is patentable.

Independent claim 12 has been amended and now recites in part "obtaining topological information about the periodic orbits of the speech signal and the natural reference signal, wherein the topological information comprises a set of topological indices that describe a relative topological relation between the periodic orbits of the speech signal and the natural reference signal" (emphasis added). The Office's references of Uchiyama, Mindlin, Trevisan, and Parra completely fail to teach or suggest a natural reference signal as claimed. Furthermore, the Office's references also fail to teach or suggest a set of topological indices that describe a relative topological relation between the periodic orbits of the speech signal and the natural reference signal for reasons similar to those given above.

For at least these reasons, independent claim 12 is patentable.

Similarly, dependent claims 13-18 are patentable based on the above reasons and their own merits.

Independent claim 19 has been amended and now recites in part “accessing a database, stored in a storage medium, having voice prints of known speakers, wherein each voice print includes a set of topological numbers to distinguish a speaker from other speakers and is derived from a relation between a periodic orbit derived from a power spectrum of a speaker's voice and a periodic orbit from a power spectrum of an audio reference in a three-dimensional space” (emphasis added). For reasons similar to those above, Uchiyama, Mindlin, and Trevisan completely fail to teach or suggest using a periodic orbit from a power spectrum of an audio reference in a three-dimensional space.

Independent claim 19 further recites “comparing a voice print of an unknown speaker to the database to determine if there is a match, wherein the voice print of the unknown speaker includes a set of topological numbers that is derived from a relation between a periodic orbit derived from a power spectrum of the unknown speaker's voice and the periodic orbit from the power spectrum of the audio reference” (emphasis added).

Applicants note that the claimed subject matter requires the same audio reference for both the voice print of the unknown speaker and the voice prints in the database. Such a requirement is not taught or suggested by Uchiyama, Mindlin, or Trevisan.

In stark contrast to the claimed subject matter, Uchiyama teaches a “distance calculator for calculating a distance between the features of the unknown speaker extracted by the feature extractor and the reference features stored in the memory” and a “decision part makes a decision as to whether or not the unknown speaker is a real speaker by comparing the calculated distance with a predetermined threshold value” (col. 2, lines 14-20). One of ordinary skill in the art would recognize that Uchiyama's disclosure uses distances between Uchiyama's features to compare speakers. As previously noted, Uchiyama's features are not equivalent to a set of topological numbers as claimed.

Thus, Applicant disagrees with the Office's assertion that it “would have been obvious to someone of ordinary skill in the art at the time of the invention to combine Mindlin with the Uchiyama device because all the claimed elements were known in the prior art and one skilled

in the art could have combined the elements as claimed by known methods with no changed in their respective functions” (Office action, page 16). First, Mindlin and Uchiyama do not teach or suggest the claimed elements. Second, Uchiyama’s storage device would have to be modified in such a way that the modifications would make Uchiyama’s system unusable because using topological numbers instead of Uchiyama’s features in Uchiyama’s distance computation would make Uchiyama’s calculating part, and accordingly Uchiyama’s decision part, inoperable because Uchiyama’s parts do not use topological numbers to distinguish a speaker from other speakers and Uchiyama’s parts are incompatible with topological numbers. Further, Trevisan also lacks the claimed elements as well as a motivation to change Uchiyama’s system.

For at least these reasons, independent claim 19 is patentable.

Similarly, dependent claims 20 and 21 are patentable based on the above reasons and their own merits.

Independent claim 22 recites in part “a storage medium that stores a set of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers” (emphasis added). The Office asserts Uchiyama against this claim limitation. However, Uchiyama fails to teach this claim limitation.

Uchiyama teaches “A distance calculating part calculates a distance between the features of the speaker extracted by the feature extracting part and reference features stored in a memory” (Abstract). In regard to features, Uchiyama teaches that “feature extractor 15 extracts features of the input speech signal for every block” and that “features are described by an arithmetical average of the time-series spectral data values over each of the blocks” (col. 5, lines 14-17). One of ordinary skill in the art would recognize the vast difference between rational numbers characterising topological features of spectral functions and Uchiyama’s arithmetical average of the time-series spectral data values. Thus, Uchiyama disclosure completely fails to disclose a set of rational numbers characterising topological features as claimed. Accordingly, Uchiyama completely fails to describe a storage medium that stores a set of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers.

Mindlin is silent on processing voice data or anything related to distinguishing a speaker. Further, Mindlin’s disclosure completely lacks a teaching to distinguish a speaker from other speakers. Thus, Mindlin’s disclosure fails to teach or suggest a storage medium that stores a set

of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers.

Further, independent claim 22 recites in part “the rational numbers are derived from a relation between a periodic orbit from a power spectrum of a speaker and a periodic orbit for a power spectrum of an audio reference in a three-dimensional space” (emphasis added). The Office fails to completely address the limitation of a periodic orbit for a power spectrum of an audio reference in a three-dimensional space as required by claim 22.

The Mindlin disclosure fails to teach or suggest the use of voice or audio signals such as an audio reference as claimed. Thus, it is not surprising that Mindlin does not teach or suggest the use of a periodic orbit for a power spectrum of an audio reference in a three-dimensional space.

Furthermore, Uchiyama fails to disclose an audio reference as claimed. One of ordinary skill in the art would recognize the difference between an audio reference and Uchiyama's reference features because Uchiyama's reference features are based on a speaker (see Uchiyama at Abstract). Like Mindlin, Uchiyama also fails to teach or suggest the use of a periodic orbit for a power spectrum of an audio reference in a three-dimensional space.

The Office states that “It would have been obvious to someone of ordinary skill in the art at the time of the invention to combine Mindlin with the Uchiyama device because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions” (Office action, page 19). However, Mindlin and Uchiyama do not teach or suggest the claimed elements. Further, Uchiyama's storage device would have to be modified in such a way that the modifications would make Uchiyama's system unusable because storing rational numbers characterising topological features of spectral functions instead of Uchiyama's features in Uchiyama's memory would make Uchiyama's calculating part, and accordingly Uchiyama's decision part, inoperable because they do not use rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers. Trevisan also lacks the claimed elements as well as a motivation to change Uchiyama's system.

For at least these reasons, claim 22 is patentable.

Independent claim 23 recites in part “a processing unit connected to the microphone and the reader head, the processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample and to compare the rational numbers of the known speaker to the topological rational numbers from the voice sample to determine whether the speaker is the known speaker” (emphasis added). For reasons similar to those presented above, Uchiyama and Mindlin disclosures do not make comparisons between rational numbers of the known speaker and topological rational numbers from the voice sample.

For at least these reasons, claim 23 is patentable.

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Concluding Comments

The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested. Accordingly, the above arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

In view of the above remarks, claims 1-27 are in condition for allowance and a formal notice of allowance is respectfully requested.

Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

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